

Impact of Seasons on Physicochemical Profiles of *Guduchi Ghana* (Dried Aqueous Extract of *Tinospora Cordifolia*)

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Publication Date: 31 December 2016

Article Link: <http://medical.cloud-journals.com/index.php/IJAAIM/article/view/Med-345>



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Abstract *Guduchi Ghana* is popularly known in Ayurvedic fraternity for its huge therapeutic credentials. Earlier studies have established the standard manufacturing procedures and quality control profiles of *Ghana*. Species of the plant, stem size, collection time, season and maturity of plant may affect the yield and physico-chemical profile of *Guduchi Ghana*. However, published data on such variations is lacking. Considering this, present study is planned to screen seasonal variations in physico-chemical profile of *Guduchi Ghana*. Eighteen batches of *Guduchi Ghana* were prepared in six different seasons (3 batches in each season) and findings were systematically recorded. The obtained *Ghana* was further subjected to relevant physico-chemical parameters. Maximum yield of *Ghana* was obtained in *Grishma Ritu* (May-June) while minimum in *Varsha* (July-August). No variations in organoleptic parameters were observed due to seasonal spells. Total alkaloidal contents and water soluble extractive values were found bit higher in *Grishma* and *Vasanta*. All functional groups were found to be same in each season. Current observations reveal variations in physico-chemical profiles of *Ghana* extracted in different seasons.

Keywords *Guduchi*; *Ritu*; *Ghana*; season; extract; *Tinospora cordifolia*

1. Introduction

Tinospora cordifolia (Willd.) Miers locally known as *Guduchi*, *Amrita* or *Giloy*, possess wide range of therapeutic activities in *Jwara* (fever), *Prameha* (diabetes), *Kamala* (jaundice), *Twak vikara* (skin diseases), etc [1-4]. Almost all parts of the plant have been reported to have medicinal values; however the stem part is used in common practice in various dosage forms, viz. *Satva* and *Ghana* [5].

Ghana Kalpana (preparation of solidified aqueous extract), a concentrated dosage form, is mentioned in Ayurvedic pharmaceuticals as an *Upakalpa* (secondary derivative preparation) of *Kwatha Kalpana* (decoction). This modification of *Panchavidhakashaya Kalpana* is needed in the present era because of advantages such as lower dose, higher concentration and more potency. '*Guduchi Ghanavati*' is mentioned by the name *Sanshamani vati* in *Jvaradhikara* and is popularly known by the Ayurvedic

fraternity for its valuable role as febrifuge and in skin disorders [6]. The Standard Manufacturing Procedures and quality control profiles of *Ghana* are well documented [7,8].

No reports are available so far on seasonal impact on quantitative variation in the final yield of *Guduchi Ghana*. Season is a natural periods of division of the year, marked by weather changes, ecology, daylight hours and temperature [9]. In Ayurveda, each season (*Ritu*) consist of two months; thus year is divided into six seasons [10,11] and emphasis is given on timely collection of different parts of plants for therapeutic purposes [12]. Thus, the current study was undertaken to revalidate the classical principles and conduct pharmaceutical study in each season to find out the effects of different seasons on physico-chemical profile of *Guduchi Ghana*.

2. Materials and Methods

Material collection and authentication

Fresh *Guduchi* stem of female variety creeping on *Neem* (*Azadirachta indica*) tree were collected from non-polluted, wild areas of Moti Panchasra village of Jamnagar district, Gujarat, India (Figure 1). After collection, the plant was authenticated as *Tinospora cordifolia* by the concerned authority in the Pharmacognosy laboratory of Gujarat Ayurved University, and the voucher specimen was kept for reference.

Batches

Total 18 batches of *Guduchi Ghana* (3 batches in each season) were prepared to get an average data. The division of seasons is listed in Table 1 to simply understand them as per Indian, Gregorian tropical and Hindu lunar calendars. All the batches prepared by using the same plant to avoid the probable variations in nature of soil.

Table 1: Division of seasons

Sr. no.	Season (<i>Ritu</i>)		
	Indian season	Gregorian tropical months	Hindu lunar months
1	<i>Shishira</i>	January-February (late winter)	<i>Magha-Falguna</i>
2	<i>Vasanta</i>	March-April (spring)	<i>Chaitra-Vaishakha</i>
3	<i>Greeshma</i>	May-June (summer)	<i>Jyeshtha-Ashada</i>
4	<i>Varsha</i>	July-August (rainy season)	<i>Shravan-Bhadrapada</i>
5	<i>Sharad</i>	September-October (autumn)	<i>Ashwina-Kartika</i>
6	<i>Hemanta</i>	November-December (early winter)	<i>Margshirsha-Pausha</i>

Method of preparation

Guduchi Ghana was prepared by following classical method. 1 kg fresh *Guduchi* stems were collected; physical impurities and papery bark were removed and washed thoroughly with potable water. Stem was made into pieces of 1-2 inches having 1.6-2.1 cm diameter and crushed thoroughly, added with four times of potable water in a SS vessel and kept for soaking overnight (12 hrs). Next morning the contents were subjected to heat with continuous stirring. Water was evaporated slowly till its reduction to 1/4th and galenical was filtered through four fold cotton cloth to obtain *Guduchi Kwatha*. The *Guduchi Kwatha* was subjected to heat with constant stirring till the entire mass converted into semi solid state. The mass was shifted into a glass tray and placed in oven at 45°C - 50°C for complete drying. After complete drying it was collected, made into fine powder through mixer grinder, passed through 80 number sieve (Figure 1) and packed in air tight container [7].

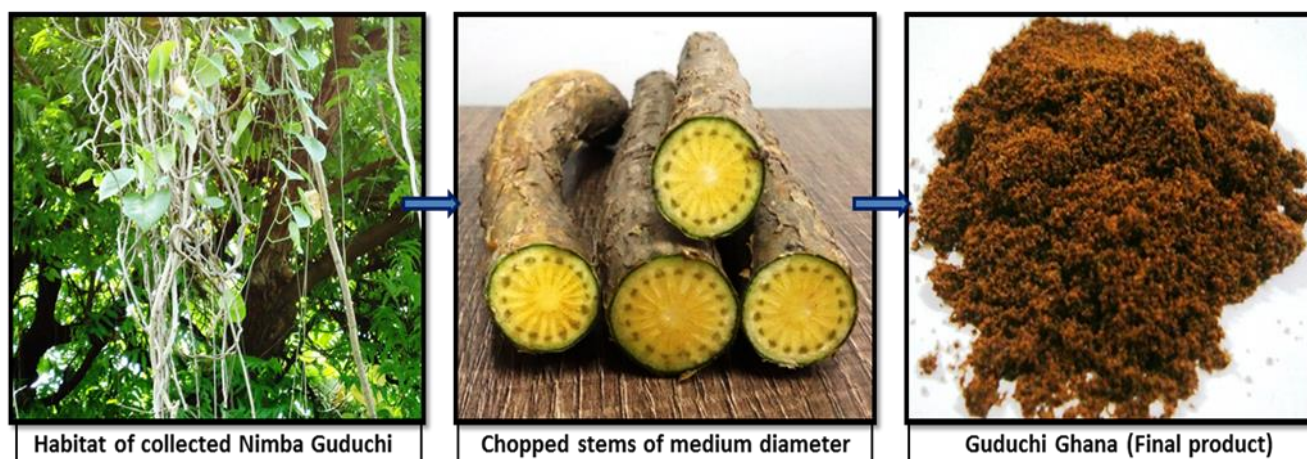


Figure 1: Collected Guduchi of medium stem size and prepared Guduchi Ghana

Physico-chemical screening

Three batches were prepared in each season to get standard values. Thus, total eighteen samples for all six seasons were prepared and those samples were subjected to Organoleptic evaluation (color, odor, taste, touch) and physicochemical analysis such as pH value, [13] loss on drying at 110°C, [14] ash value, [15] and extractive values [16]. The samples were further subjected to qualitative tests for various functional groups [17,18] and quantitative estimations of total alkaloids [19]. Average value for consecutive three batches prepared in one season was calculated and compiled in Table 2.

3. Results and Discussion

Neem Guduchi was selected because *Guduchi* associated with *Neem* tree is believed to be best as the synergy between these plants enhances its efficacy [20]. Female gender of plant was selected as it contain more total alkaloids or therapeutic phytoconstituents level than male [21,22]. Fresh *Guduchi* was chosen for the study as classics instruct to use it always in fresh state [23]. The whole plant is used medicinally; however, the stem part was selected for study as it is approved for use in medicine due to higher alkaloid content as listed by the Ayurvedic Pharmacopoeia of India [24]. In classics, “*Anguṣṭha pramaṇa*” (thumb size) of *Guduchi* stem has been mentioned to be used; [25] accordingly, thumb sized or medium size stems having average diameter 1.6-2.1 cm were selected for study.

The results reveal that the obtained percentages of dried *Ghana* were varying among six seasons (Figure 2). The yield of *Guduchi Ghana* is found to be more in May-June (*Grishma*); whereas it was least in July-August (*Varsha*). This could be due to more concentration of phytoconstituent levels during hot seasons; nevertheless, further studies are warranted to support the assumption. As mentioned according to Indian Pharmacopoeia, the bitter principles are most abundant and concentrated during hot season. Seasonal differences have been shown to exert differences in the cellular activities and phyto-constituents levels of a plant [26]. This may be the reason for the more obtained yield of dried aqueous extract (*Ghana*) in *Grishma Ritu*. The percentage of *Ghana* obtained in *Vasanta* and *Hemanta* showed insignificant difference. Details of *Guduchi Ghana* preparation, organoleptic characters, physico-chemical and qualitative differences of functional groups are placed in Table 2.

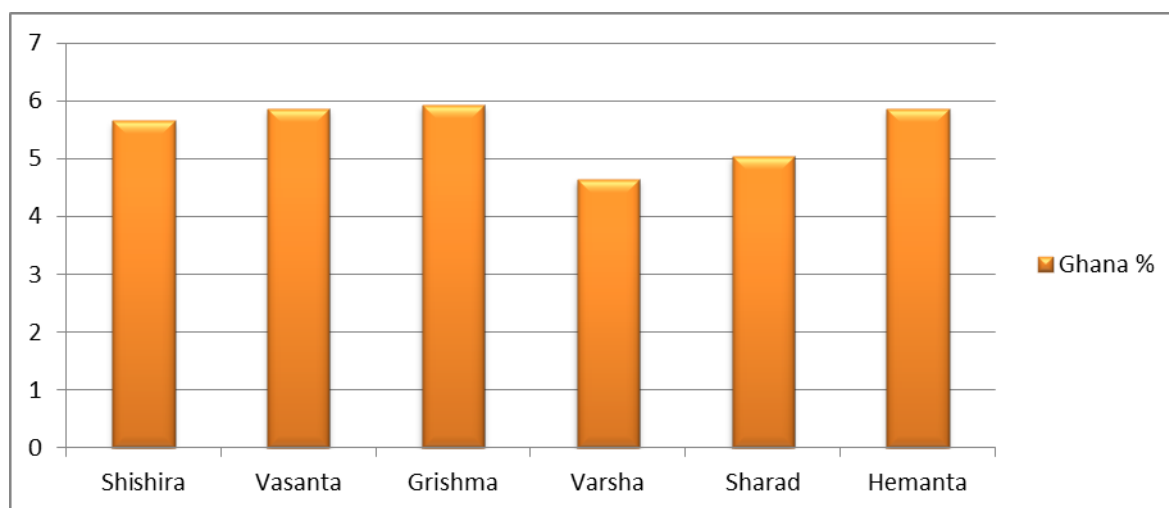


Figure 2: Quantitative estimation of Guduchi Ghana obtained in different seasons

In organoleptic analysis, the sample obtained in individual seasons showed no variations in colour, smell, taste, touch and appearance. Observation of physico-chemical parameters shows meager variations in ash value, pH, loss on drying and extractive values except water soluble extract. No significant seasonal variations in percentage of total alkaloid contents were observed; however, these contents found to be bit higher in *Vasanta* and *Grishma*. *Charaka* also advocate collecting stems in *Vasanta* and *Varsha Ritu* [12]. But for extraction of *Guduchi Ghana* from stem, specific season has not been mentioned in classics. Present research findings are partially consistent to the above mentioned *Ritu* as far as collection season of stem, yield of *Ghana* extraction and total alkaloidal contents are concerned. Extensive quantitative analytical study may elaborate changes in percentage of chemical constituents of *Ghana* prepared in different seasons. All functional groups were found to be same in each season. Alkaloids, glycosides, tannins, carbohydrates, phenols, steroids and starch were present while saponins, flavanoids, and proteins were absent (Table 2). A recent study revealed that total phenolics and total sugar concentration obtained highest values in summer season while starch and tannin content were found maximum in winter season in both the genders of *Tinospora cordifolia*. It also reported that the best harvesting seasons for *Tinospora cordifolia* may be either winter or late summer for antioxidant potential and immunomodulator activities and monsoon for antidiabetic activity [27].

Table 2: Average Results of Guduchi Ghana in different seasons

Parameters	Season					
	<i>Shishira</i>	<i>Vasanta</i>	<i>Grishma</i>	<i>Varsha</i>	<i>Sharad</i>	<i>Hemanta</i>
Pharmaceutical						
Fresh <i>Guduchi</i> stem (kg)	1	1	1	1	1	1
Stem diameter (cm)	1.6-2.1	1.6-2.1	1.6-2.1	1.6-2.1	1.6-2.1	1.6-2.1
Quantity of potable water (L)	4	4	4	4	4	4
Total yield of dried <i>Ghana</i> (g)	56.5	58.6	59.3	46.5	50.4	58.7
% Yield of dried <i>Ghana</i>	5.65	5.86	5.93	4.65	5.04	5.87

Organoleptic						
Colour	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown
Smell	Aromatic (chocolaty)	Aromatic (chocolaty)	Aromatic (chocolaty)	Aromatic (chocolaty)	Aromatic (chocolaty)	Aromatic (chocolaty)
Taste	Bitter	Bitter	Bitter	Bitter	Bitter	Bitter
Touch	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
Appearance	Amorphous powder	Amorphous powder	Amorphous powder	Amorphous powder	Amorphous powder	Amorphous powder
Physico-chemical parameters						
pH value	5.91	5.90	5.90	5.93	5.90	5.90
Loss on drying at 110°C (% w/w)	7.46	7.73	7.52	7.95	7.69	7.71
Ash value (% w/w)	16.50	16.84	16.58	16.35	16.78	16.60
Acid insoluble ash (% w/w)	0.50	0.49	0.48	0.51	0.48	0.49
Water soluble extract (% w/w)	48.65	48.90	48.97	48.44	48.56	48.47
Alcohol soluble extract (% w/w)	17.1	17.0	17.2	17.1	17.1	16.9
Chloroform soluble extract (% w/w)	0.85	0.86	0.84	0.87	0.86	0.86
Benzene soluble extract (% w/w)	0.08	0.07	0.08	0.09	0.07	0.08
Diethyl ether soluble extract (% w/w)	0.05	0.06	0.06	0.05	0.05	0.06
Total alkaloid content (%)	0.57	0.61	0.63	0.58	0.57	0.58
Qualitative tests for various functional groups						
Glycosides	+ve	+ve	+ve	+ve	+ve	+ve
Alkaloids	+ve	+ve	+ve	+ve	+ve	+ve
Tannin	+ve	+ve	+ve	+ve	+ve	+ve
Saponin	-ve	-ve	-ve	-ve	-ve	-ve
Flavonoids	-ve	-ve	-ve	-ve	-ve	-ve
Phenols	+ve	+ve	+ve	+ve	+ve	+ve
Proteins	-ve	-ve	-ve	-ve	-ve	-ve
Carbohydrates	+ve	+ve	+ve	+ve	+ve	+ve
Starch	+ve	+ve	+ve	+ve	+ve	+ve
Sterol/Steroid	+ve	+ve	+ve	+ve	+ve	+ve

+ve =present; -ve =absent

Regional and seasonal or climatic variations are reported in number of medicinal plants and availability of active principles and secondary metabolites are affected by seasonal effects. Plant circadian rhythms signals the plant what season it is and accordingly levels of phyto-hormones (physiological intercellular messengers) changes over the lifespan of a plant which are responsible for cellular/enzymatic activities, cell constituent level and plant growth [5]. Thus, the constituent and active principles vary in quantity and/or quality during different seasons throughout the year. The findings of present study also support these reports and ascertain that periodicity of seasons have impact on extractive principles of *Guduchi Ghana*. It signifies that, collection of herb in different seasons may have significant influence on expression of its pharmacological and clinical bioactivities.

Though, present study is preliminary, it is a petite endeavor to find thoroughly the facts or confirmation of Ayurvedic Principles. More extensive sophisticated analytical studies on quantification of chemical constituents and secondary metabolites are needed. The drug exhibits multiple target actions and several therapeutic claims by virtue of its various active phytomolecules. Further analytical works may throw more light on the seasonal changes in level of active principles which possess distinctive biological roles.

4. Conclusion

Yield of *Guduchi Ghana* depends upon season of collection of *Guduchi* and manufacture. Maximum yield of *Ghana* was obtained in *Grishma Ritu* while minimum in *Varsha*, therefore *Grishma Ritu* should be utilized by manufacturers for maximum yield. Total alkaloidal contents found to be bit higher in *Grishma* and *Vasanta*. The current observations also reveal variations in physico-chemical profiles of *Ghana* extracted in different seasons. The study is preliminary and pre-clinical and clinical investigations are warranted to further explore the activity of different seasons.

References

- [1] Sharma R, Amin H, Galib R, Prajapati PK. Therapeutic vistas of Guduchi (*Tinospora cordifolia* (willd.) Miers): a medico-historical memoir. *J Res Educ Indian Med.* 2014. XX (2) 121-135.
- [2] Sharma R, Amin H, Galib R, Prajapati PK. Antidiabetic claims of *Tinospora cordifolia* (Willd.) Miers: critical appraisal and role in therapy. *Asian Pac J Trop Biomed.* 2015. 5 (1) 68-78.
- [3] Sharma Rohit, Kumar V, Ashok BK, Galib R, Prajapati PK, Ravishankar B. Evaluation of hypoglycaemic and anti-hyperglycaemic activities of Guduchi Ghana in Swiss albino mice. *Int J Green Pharm.* 2013. 7; 145-8.
- [4] Sharma Rohit, Kumar V, Ashok BK, Galib R, Prajapati PK, Ravishankar B. Hypoglycemic and anti-hyperglycemic activity of Guduchi Satva in experimental animals. *AYU.* 2014. 4; 217-20.
- [5] Sharma R, Amin HRG, Prajapati PK. Seasonal variations in physicochemical profiles of Guduchi Satva (starchy substance from *Tinospora cordifolia* [Willd.] Miers). *J Ayurveda Integr Med.* 2013. 4; 193-7.
- [6] Acharya YT. *Siddha Yoga Sangraha*. 13th ed. Jwaradhikar1/6:4, Nagpur: Baidyanath Ayurveda Bhavan Ltd; 2008. Sharangadhara. *Sharangadhara Samhita*, Madhyama Khanda, Chapter 8/1. 6th ed. Varanasi: Chaukhamba Orientalia; 2005.
- [7] Sharma R, Galib, Prajapati PK. Validation of Standard Manufacturing Procedure of Guduchi Ghana (dried aqueous extract of *Tinospora cordifolia* (willd) Miers) and its tablets. *Ayurpharm Int J Ayur Alli Sci.* 2013. 2 (7) 224-232.
- [8] Sharma R, Amin H, Galib, Prajapati PK. Quality control evaluation of Guduchi Ghana (dried aqueous extract of *Tinospora cordifolia* (willd) Miers)- an herbal formulation. *SLJIM.* 2013. 3 (1) 174-179.
- [9] Tucker P, Gilliland J. The effect of season and weather on physical activity: A systemic review. *Public Health.* 2007. 121 (12) 909-922.
- [10] Acharya YT, editor, (Reprint edition) *Sushruta Samhita of Sushruta; Sutrasthana; Ritucharya Adhayaya*: ch. 6, ver. 6, Varanasi: Chaukhambha Surabharti Prakashana. 2010. 24.
- [11] Paradakara S, (Reprint edition.) *Ashatanga Hridya of Vagbhata; Sutrasthana; Ritucharya Adhayaya*: ch 3, ver. 2. Delhi: Sri Satguru Publication. 2010. 39.

- [12] Acharya YT, (Reprint edition.) Charaka Samhita of Agnivesha; Kalpasthana; Madanakalpa: ch. 1, ver. 10. Varanasi: Chaukhamba Orientalia. 2011. 653.
- [13] Anonymus. The Ayurvedic Pharmacopoeia of India, Part 1, Vol 1., Appendix 2 (3.3), 1st ed. New Delhi: Govt. of India, Ministry of Health and Family Welfare. 1999. 230.
- [14] Anonymus. The Ayurvedic Pharmacopoeia of India, Part 1, Vol 1., Appendix 2.2.9, 1st ed. New Delhi: Govt. of India, Ministry of Health and Family Welfare. 1999. 214.
- [15] Anonymus. The Ayurvedic Pharmacopoeia of India, Part 1, Vol 1., Appendix 2.2.3, 1st ed. New Delhi: Govt. of India, Ministry of Health and Family Welfare. 1999. 213.
- [16] Anonymus. The Ayurvedic Pharmacopoeia of India, Part 1, Vol 1., Appendix 2.2.6 to 2.2.8, 1st ed. New Delhi: Govt. of India, Ministry of Health and Family Welfare. 1999. 214.
- [17] Baxi AJ, Shukla VJ, Bhatt UB. Methods of qualitative testing of some Ayurvedic formulations. 1st ed. Jamnagar: Gujarat Ayurved University. 2001. 5-12.
- [18] Khandelwal KR. Practical Pharmacognosy Techniques and Experimental. 16th ed. Pune: Nirali Prakashan. 2006. 149-56.
- [19] Stephen K. Medicinal plant alkaloids: an introduction for pharmacy students. 2nd ed. University of Toronto press. 1965. 44.
- [20] Anonymous. Quality Standards of Indian Medicinal Plants. Vol. 1. New Delhi: ICMR. 2003. 212.
- [21] Sharma R, Amin H, Prajapati PK. Physicochemical evaluation of Satva extracted from male and female plants of Guduchi (*Tinospora cordifolia* (Willd.) Miers). J Ayu Herb Med. 2015. 1 (1) 13-16.
- [22] Sharma R, Amin H, Prajapati PK. Physicochemical evaluation of male and female plants of Guduchi (*Tinospora cordifolia* (Willd.) Miers). The Journal of Phytopharmacology. 2015. 4 (2) 116-120.
- [23] Shastri P, editor, (6th ed.) Commentary Adhamalla's Dipika and Kasirama's Gudārtha Dipika on Sharangadhara Samhita of Sharangadhara, Prathama Khanda; Chapter 1, Verse 45. Varanasi: Chaukhamba Orientalia. 2005. 11.
- [24] Anonymus. The Ayurvedic Pharmacopoeia of India, Part I, Vol. 1., 1st ed. New Delhi: Govt. of India, Ministry of Health and Family Welfare. 2001. 53-5.
- [25] Sharma R, Amin HG, Prajapati PK. Validation of standard manufacturing procedure of Gudūci sattva (aqueous extract of *Tinospora cordifolia* (Willd.) Miers) and its tablets. Ancient Sci Life. 2013. 33; 27-34.
- [26] Manika N, Mishra P, Kumar N, Chanotiya CS, Bagchi GD. Effect of season on yield and composition of the essential oil of *Eucalyptus citriodora* Hook. leaf grown in sub-tropical conditions of North India. Journal of Medicinal Plants Research. 2012. 6 (14) 2875-79.
- [27] Choudhary N, Singh S, Siddiqui MB, Khatoon S. Impact of Seasons and Dioecy on therapeutic phytoconstituents of *Tinospora cordifolia*, a Rasayana Drug. BioMed Research International, Volume 2014, <http://dx.doi.org/10.1155/2014/902138>.